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Envirocon Inc
Air monitoring program report

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AIR MONITORING PROGRAM REPORT

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LIVINGSTON, MONTANA

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AIR MONITORING PROGRAM REPORT
LIVINGSTON RAIL YARD
LIVINGSTON, MONTANA

Submitted to:

Montana Department of Health
and Environmental Sciences
Cogswell Building
Helena, Montana 59620

Submitted by:

Envirocon, Inc.
101 International Way
P.O. Box 8243
Missoula, Montana 59807

February 23, 1990

ENVIROCON, INC.

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2.0 METHODOLOGY

NIOSH methodologies are utilized for monitoring both ambient conditions and employee exposures, as described in Section 9.7 and 11.9 of the IRMWP. In addition, real-time air monitoring, using photoionization detectors (PIDs), is conducted to provide instantaneous qualitative results of organic levels in work zones. This information is used to determine appropriate levels of employee protection and/or modify work activities to decrease emissions. The following is a methodology description of both real-time (qualitative) and NIOSH (quantitative) air monitoring. For further information refer to Section 9.7 and 11.9 of the IRMWP.

2.1 Real-Time Air Monitoring

Real-time air monitoring is conducted using Photovac Microtip PIDs. The instruments are operated, calibrated, and maintained according to manufacturer specifications. The PIDs are calibrated daily at a minimum. Air monitoring is conducted at and within the work zone boundaries. Readings are taken both continuously and at discrete time periods, depending on work activities. PID readings, along with work activities, weather conditions, sample locations, and times, are recorded in bound and numbered log books. Action levels have been established for ambient conditions within work zones and are listed in Section 11.9 of the IRMWP.

2.2 NIOSH Air Monitoring

NIOSH methodologies are used for both employee exposure monitoring and emissions monitoring. Air monitoring for total dust, volatile organics, and PNAs is conducted using the following sampling and analytical procedures:

PNAs	NIOSH Method 5506
Volatile Organics (VOAs)	NIOSH Methods 1500, 1501, 1003 1022, and 1015
Total Dust	NIOSH Method 0500

Air sampling pumps (Gilian Model HFS113A) are calibrated before and after each sampling event. All sampling information, including sample cartridge numbers, sample pump identification numbers, calibration information, dates, and times, is recorded in a bound air monitoring log book.

The air sampling pumps are generally located at the upwind and downwind borders of a work zone for emissions monitoring. In addition air sampling pumps are attached to employees within the work zones for employee-exposure monitoring. Employee-exposure monitoring can be used to determine worst case work zone emissions. The sampling pumps are positioned to sample air in the breathing zone. Information, including dates, starting times, ending times, weather conditions, flow rates, sample volumes, and work activities, is recorded in the air sampling log book.

Air sampling frequency is determined through evaluation of expected work activities and known site conditions with respect to the potential for emissions of particulates, PNAs, and VOAs. Generally, new work zones or new field activities will be monitored for emissions if it is determined that the potential for release of organics or particulates in quantities of concern exists. Sampling frequency for a particular work zone or activity will be modified, as appropriate, based upon the air sampling results.

2.2.1 Analytical Methods

Sample cartridges are sent to Clayton Environmental Consultants, which is accredited by the American Industrial Hygiene Association (AIHA).

Standard QA/QC protocols for air monitoring, including chain-of-custody forms, and analyses of cartridge blanks, are conducted.

Samples are currently analyzed for the following constituents, with the analytical detection limits noted:

COMPOUND	DETECTION LIMIT
VOAs	
Tetrachloroethene	.004 mg
Trichloroethylene	.004 mg
1,1-Dichloroethene	.001 mg
Benzene	.002 mg
Chlorobenzene	.003 mg
Naphthalene	.01 mg
Chlorotoluene	.006 mg
1,2-Dichloroethene	.006 mg
PNAs	
Naphthalene	0.2 ug
Acenaphthylene	0.2 ug
Acenaphthene	0.6 ug
Fluorene	0.02 ug
Phenanthrene	0.02 ug
Anthracene	0.02 ug
Fluoranthene	0.02 ug
Pyrene	0.02 ug
Benzo(a)anthracene	0.02 ug
Chrysene	0.02 ug
Benzo(b)fluoranthene	0.04 ug
Benzo(k)fluoranthene	0.02 ug
Benzo(a)pyrene	0.02 ug
Dibenzo(a,h)anthracene	0.02 ug
Benzo(g,h,i)perylene	0.02 ug
Indeno(1,2,3-cd)pyrene	0.02 ug
Total Particulates	0.1 mg

Sample detection limits are determined by the volume of air passing through the sample cartridge. Sample pump flow rates and run times which provide sufficient air volumes to achieve the target detection limits

are used. Total run times are determined with respect to potential maximum contaminant levels to avoid breakthrough of compounds through the collection media.

3.0 ANALYTICAL RESULTS

3.1 Real-Time Air Monitoring

Real-time air monitoring results using the PIDs have not approached or exceeded the set action level of 9 units requiring Level C personnel protection. Generally, the only readings above 0.0 units have occurred while placing the PIDs in worst-case areas, such as the excavator bucket covered with sludge. The quantitative air monitoring (NIOSH methods) results detailed below confirm that levels of organics within and emanating from work zones have been below levels of concern.

3.2 NIOSH Monitoring Events

The following is a list of sampling events conducted to date using NIOSH methodology. The location, activity, and weather conditions are listed.

November 22, 1989 - *Location:* Waste water treatment plant sump work zone. *Activity*: Removing liquids and investigating sludge volume using the tracked backhoe. *Weather:* Clear, 45 degrees, light wind from the west.

November 29, 1989 - *Location:* API separator and overflow pond work zone. *Activity:* Moving sludge from upper to lower pit, using the tracked excavator. Dozer operator in bottom of pit moving sludge. *Weather:* Clear, 35 degrees, 15-25 mph wind from the southwest.

December 28, 1989 - *Location:* Cinder pile work zone. *Activity:* Moving sludge from cinder pile lagoon to the lined pit, with the tracked excavator. *Weather:* Overcast, 38 degrees, 0-5 mph wind from the southwest in the morning, switching to 0-5 mph from the northeast in the afternoon.

January 21, 1990 - *Location:* Inside LRC maintenance shop. *Activity:* Install Monitor Well 89-8. *Weather*: 50 degrees and no wind.

January 31, 1990 - *Location:* Waste water treatment plant sump work zone. *Activity:* Transloading sludges from sump to temporary holding pond, with hydraulic pumps. *Weather*: Clear, 10-18 degrees, 5-10 mph wind from northeast.

February 2, 1990 - *Location:* Hydrocarbon Test Cell 2. *Activity:* Installing Monitor Well HRO-7. *Weather:* Clear, 16-34 degrees, 5-10 mph wind from the west.

3.2.1 NIOSH Analytical Results

The analytical results for the first three air monitoring events are found in Appendix A. The following table is the list of the samples with the relevant information.

DATE	LAB SAMPLE	SAMPLE TYPE NUMBER	SAMPLE LOCATION	COMPOUNDS DETECTED	PARTICULATES DETECTED
11-22	789375	VOA	UW	no	
11-22	789376	VOA	DW	no	
11-22	789368	PNA/Part.	UW	no	.2 mg/m^3
11-22	789369	PNA/part.	DW	no	.2 mg/m^3
11-29	789377	VOA	P	no	
11-29	789378	VOA	UW	no	
11-29	789379	VOA	DW	no	
11-29	789380	VOA	P	yes	
11-29	789370	PNA/Part.	P	no	1.0 mg/m^3
11-29	789371	PNA/Part.	UW	no	.3 mg/m^3
11-29	789372	PNA/Part.	DW	no	.2 mg/m^3
12-28	794403	VOA	UW	no	
12-28	794404	VOA	DW	no	
12-28	794398	PNA/Filter	UW	no	<.2 mg/m^3
12-28	794399	PNA/Filter	DW	no	<.2 mg/m^3
12-28	794400	PNA/Tube	DW	yes	
12-28	794401	PNA/Tube	UW	yes	

Sample Locations: UW - upwind, DW - downwind, P - personnel

3.2.2 Discussion of Results

During the November 22, 1989, sampling event at the WWTP sump, no VOAs or PNAs were detected. Particulates were measured both upwind and downwind of the work zone at .2 mg/cubic meter. These readings indicate that the particulates were not increased beyond background concentrations during remedial activities.

During the November 29, 1989, sampling event at the API separator and overflow ponds, the upwind and downwind work zone samples did not detect VOAs or PNAs. Sample Number 789380 was a personnel sample on the bulldozer operator moving sludge in the API separator pond. Consistent with the sludge characterization, .03 ppm of chlorotoluene was detected on this sample. The PEL for chlorotoluene is 50 ppm. A particulate concentration of 1.0 mg/cubic meter was also detected on the bulldozer operator sample. The PEL for nuisance dust is 10 mg/ cubic meter.

During the December 28, 1989, sampling event at the cinder pile lagoon work zone, both PNA tube samples detected slightly higher than detection levels of naphthalene. Note that due to the switch in wind during the day, both samples were exposed to upwind and downwind locations. Future sampling results may help determine if naphthalene is present in background concentrations at the rail yard.

4.0 SUMMARY

Air sampling results to date, using both real-time (PID) and quantitative (NIOSH) methods, indicate that the initial remedial activities are not causing emissions of VOAs, PNAs or total dust in concentrations of concern. In addition, the air sampling results indicate that level C personnel protection within the work zones is very conservative, and modifications of personnel protection may be appropriate based on further air monitoring results.

Air monitoring will be continued using both the PIDs and NIOSH methodology. NIOSH air sampling will be conducted when new activities or new work sites are initiated in which it is determined that the potential for emissions of organics or particulates in concentrations of concern exists.

APPENDIX A

CLAYTON ENVIRONMENTAL CONSULTANTS, INC.
22345 Roethel Drive Novi, Michigan 48050

Mr. John Mills
Hydrogeologist
ENVIROCON, INC.
P.O. Box 1154
Livingston, MT 59047

Date Reported: 8-DEC-89
Date Received: 1-DEC-89
Clayton Project No.: 62403-17
Partial Report

Dear Mr. Mills:

The following is our report on the samples submitted for analysis.

Table 1

Lab Number	Sample Description	Air Volume (Liters)	Tetrachloro-ethene (mg)	Tetrachloro-ethene (ppm)	Trichloro-ethylene (mg)	Trichloro-ethylene (ppm)	1,1-Dichloroethene (mg)	1,1-Dichloroethene (ppm)
789375	140101 AA-005	64.52	<0.004	<0.009	<0.004	<0.01	<0.001	<0.004
789376	140101 AA-006	60.18	<0.004	<0.01	<0.004	<0.01	<0.001	<0.004
789377	140101 AP-011	79.1	<0.004	<0.007	<0.004	<0.009	<0.001	<0.003
789378	140101 AA-012	105.4	<0.004	<0.006	<0.004	<0.007	<0.001	<0.002
789379	140101 AA-013	104.4	<0.004	<0.006	<0.004	<0.007	<0.001	<0.002
789380	140101 AP-016	40.4	<0.004	<0.01	<0.004	<0.02	<0.001	<0.006
789381	140101 AP-017	40.4	<0.004	<0.01	<0.004	<0.02	<0.001	<0.006
	Limit of Detection:		0.004 mg		0.004 mg		0.001 mg	
	Analytical Method (NIOSH):		1003		1022		1015	

Table 2

Lab Number	Sample Description	Air Volume (Liters)	Benzene (mg)	Benzene (ppm)	Chlorobenzene (mg)	Chlorobenzene (ppm)	Naphthalene (mg)	Naphthalene (ppm)
789375	140101 AA-005	64.52	<0.002	<0.01	<0.003	<0.01	<0.01	<0.03
789376	140101 AA-006	60.18	<0.002	<0.01	<0.003	<0.01	<0.01	<0.03
789377	140101 AP-011	79.1	<0.002	<0.008	<0.003	<0.008	<0.01	<0.02
789378	140101 AA-012	105.4	<0.002	<0.006	<0.003	<0.006	<0.01	<0.02
789379	140101 AA-013	104.4	<0.002	<0.006	<0.003	<0.006	<0.01	<0.02

Table 2, continued

Lab Number	Sample Description	Air Volume (Liters)	Benzene (mg)	Benzene (ppm)	Chlorobenzene (mg)	Chlorobenzene (ppm)	Naphthalene (mg)	Naphthalene (ppm)
789380	140101 AP-016	40.4	<0.002	<0.02	<0.003	<0.02	<0.01	<0.05
789381	140101 AP-017	40.4	<0.002	<0.02	<0.003	<0.02	<0.01	<0.05
Limit of Detection:			0.002 mg		0.003 mg		0.01 mg	
Analytical Method (NIOSH):			1500		1003		1501	

The results for naphthalene have been corrected for a desorption efficiency of 37%.

Table 3

Lab Number	Sample Description	Air Volume (Liters)	Chlorotoluene (mg)	Chlorotoluene (ppm)	1,2-Dichloroethene (mg)	1,2-Dichloroethene (ppm)
789375	140101 AA-005	64.52	<0.006	<0.02	<0.006	<0.02
789376	140101 AA-006	60.18	<0.006	<0.02	<0.006	<0.03
789377	140101 AP-011	79.1	<0.006	<0.01	<0.006	<0.02
789378	140101 AA-012	105.4	<0.006	<0.01	<0.006	<0.01
789379	140101 AA-013	104.4	<0.006	<0.01	<0.006	<0.01
789380	140101 AP-016	40.4	0.006	0.03	<0.006	<0.04
789381	140101 AP-017	40.4	<0.006	<0.03	<0.006	<0.04
Limit of Detection:			0.006 mg		0.006 mg	
Analytical Method (NIOSH):			1003		1003	

The results for chlorotoluene have been corrected for a desorption efficiency of 93%.

Notes

Back sections were checked and showed no significant breakthrough.

The results have not been blank corrected. Please note that a blank should be submitted with each sample set.

The remaining results will be forwarded upon completion.

We appreciate the opportunity to be of assistance to you. Please call our Client Services Department at (313) 344-2650 or me if you have any questions.

Ellen Coffman for

Robert Lieckfield Jr., C.I.H.
Manager, Laboratory Services

CLAYTON ENVIRONMENTAL CONSULTANTS, INC.
22345 Roethel Drive Novi, Michigan 48050

Mr. John Mills
Hydrogeologist
ENVIROCON INC.
P.O. Box 1154
Livingston, MT 59047

Date Reported: 9-JAN-90
Date Received: 1-DEC-89
Clayton Project No.: 62403-17
Final Report

Dear Mr. Mills:

The following is our report on the samples submitted for analysis.

Table 1

Lab Number: 789368
Sample Description: 140101 AA-001, 140101 AA-002
Air Volume (Liters): 448.5

Compound	Filter (ug)	Tube (ug)	Total (ug)	Total (ug/m3)	Limit of Detection (ug)
Naphthalene	<0.1	0.2	≤0.3	≤0.7	0.2
Acenaphthylene	<0.1	<0.1	<0.2	<0.4	0.2
Acenapthene	<0.3	<0.3	<0.6	<1	0.6
Fluorene	<0.01	<0.01	<0.02	<0.04	0.02
Phenanthrene	<0.01	<0.01	<0.02	<0.04	0.02
Anthracene	<0.01	<0.01	<0.02	<0.04	0.02
Fluoranthene	<0.01	<0.01	<0.02	<0.04	0.02
Pyrene	<0.01	<0.01	<0.02	<0.04	0.02
Benzo(a)anthracene	<0.01	<0.01	<0.02	<0.04	0.02
Chrysene	<0.01	<0.01	<0.02	<0.04	0.02
Benzo(b)fluoranthene	<0.02	<0.02	<0.04	<0.09	0.04
Benzo(k)fluoranthene	<0.01	<0.01	<0.02	<0.04	0.02
Benzo(a)pyrene	<0.01	<0.01	<0.02	<0.04	0.02
Dibenzo(a,h)anthracene	<0.01	<0.01	<0.02	<0.04	0.02
Benzo(g,h,i)perylene	<0.01	<0.01	<0.02	<0.04	0.02
Indeno(1,2,3,c,d)pyrene	<0.01	<0.01	<0.02	<0.04	0.02

Analytical Method (NIOSH): 5506

Table 2

Lab Number: 789369
Sample Description: 140101 AA-003, 140101 AA-004
Air Volume (Liters): 414.8

Compound	Filter (ug)	Tube (ug)	Total (ug)	Total (ug/m3)	Limit of Detection (ug)
Naphthalene	<0.1	0.3	<0.4	<1.0	0.2
Acenaphthylene	<0.1	<0.1	<0.2	<0.5	0.2
Acenapthene	<0.3	<0.3	<0.6	<1	0.6
Fluorene	<0.01	<0.01	<0.02	<0.05	0.02
Phenanthrene	<0.01	<0.01	<0.02	<0.05	0.02
Anthracene	<0.01	<0.01	<0.02	<0.05	0.02
Fluoranthene	<0.01	<0.01	<0.02	<0.05	0.02
Pyrene	<0.01	<0.01	<0.02	<0.05	0.02
Benzo(a)anthracene	<0.01	<0.01	<0.02	<0.05	0.02
Chrysene	<0.01	<0.01	<0.02	<0.05	0.02
Benzo(b)fluoranthene	<0.02	<0.02	<0.04	<0.10	0.04
Benzo(k)fluoranthene	<0.01	<0.01	<0.02	<0.05	0.02
Benzo(a)pyrene	<0.01	<0.01	<0.02	<0.05	0.02
Dibenzo(a,h)anthracene	<0.01	<0.01	<0.02	<0.05	0.02
Benzo(q,h,i)perylene	<0.01	<0.01	<0.02	<0.05	0.02
Indeno(1,2,3,c,d)pyrene	<0.01	<0.01	<0.02	<0.05	0.02

Analytical Method (NIOSH): 5506

Table 3

Lab Number: 789370
Sample Description: 140101 AP-014, 140101 AP-015
Air Volume (Liters): 283.9

Compound	Filter (ug)	Tube (ug)	Total (ug)	Total (ug/m3)	Limit of Detection (ug)
Naphthalene	<0.1	0.2	<0.3	<1	0.2
Acenaphthylene	<0.1	<0.1	<0.2	<0.7	0.2
Acenapthene	<0.3	<0.3	<0.6	<2	0.6
Fluorene	<0.01	<0.01	<0.02	<0.07	0.02
Phenanthrene	0.01	<0.01	<0.02	<0.07	0.02
Anthracene	<0.01	<0.01	<0.02	<0.07	0.02
Fluoranthene	<0.01	<0.01	<0.02	<0.07	0.02
Pyrene	<0.01	<0.01	<0.02	<0.07	0.02
Benzo(a)anthracene	<0.01	<0.01	<0.02	<0.07	0.02
Chrysene	<0.01	<0.01	<0.02	<0.07	0.02
Benzo(b)fluoranthene	<0.02	<0.02	<0.04	<0.1	0.04
Benzo(k)fluoranthene	<0.01	<0.01	<0.02	<0.07	0.02
Benzo(a)pyrene	<0.01	<0.01	<0.02	<0.07	0.02
Dibenzo(a,h)anthracene	<0.01	<0.01	<0.02	<0.07	0.02
Benzo(g,h,i)perylene	<0.01	<0.01	<0.02	<0.07	0.02
Indeno(1,2,3,c,d)pyrene	<0.01	<0.01	<0.02	<0.07	0.02

Analytical Method (NIOSH): 5506

Table 4

Lab Number: 789371
Sample Description: 140101 AA-007, 140101 AA-009
Air Volume (Liters): 641.9

Compound	Filter (ug)	Tube (ug)	Total (ug)	Total (ug/m3)	Limit of Detection (ug)
Naphthalene	<0.1	0.1	<0.2	<0.3	0.2
Acenaphthylene	<0.1	<0.1	<0.2	<0.3	0.2
Acenapthene	<0.3	<0.3	<0.6	<0.9	0.6
Fluorene	<0.01	<0.01	<0.02	<0.03	0.02
Phenanthrene	<0.01	<0.01	<0.02	<0.03	0.02
Anthracene	<0.01	<0.01	<0.02	<0.03	0.02
Fluoranthene	<0.01	<0.01	<0.02	<0.03	0.02
Pyrene	<0.01	<0.01	<0.02	<0.03	0.02
Benzo(a)anthracene	<0.01	<0.01	<0.02	<0.03	0.02
Chrysene	<0.01	<0.01	<0.02	<0.03	0.02
Benzo(b)fluoranthene	<0.02	<0.02	<0.04	<0.06	0.04
Benzo(k)fluoranthene	<0.01	<0.01	<0.02	<0.03	0.02
Benzo(a)pyrene	<0.01	<0.01	<0.02	<0.03	0.02
Dibenzo(a,h)anthracene	<0.01	<0.01	<0.02	<0.03	0.02
Benzo(g,h,i)perylene	<0.01	<0.01	<0.02	<0.03	0.02
Indeno(1,2,3,c,d)pyrene	<0.01	<0.01	<0.02	<0.03	0.02

Analytical Method (NIOSH): 5506

ENVIROCON INC.
Clavton Project No.: 62403-17

Table 5

Lab Number: 789372
Sample Description: 140101 AA-008, 140101 AA-010
Air Volume (Liters): 589.3

Compound	Filter (ug)	Tube (ug)	Total (ug)	Total (ug/m3)	Limit of Detection (ug)
Naphthalene	<0.1	0.2	≤0.3	≤0.5	0.2
Acenaphthylene	<0.1	<0.1	<0.2	<0.3	0.2
Acenapthene	<0.3	<0.3	<0.6	<1	0.6
Fluorene	<0.01	<0.01	<0.02	<0.03	0.02
Phenanthrene	<0.01	<0.01	<0.02	<0.03	0.02
Anthracene	<0.01	<0.01	<0.02	<0.03	0.02
Fluoranthene	<0.01	<0.01	<0.02	<0.03	0.02
Pyrene	<0.01	<0.01	<0.02	<0.03	0.02
Benzo(a)anthracene	<0.01	<0.01	<0.02	<0.03	0.02
Chrysene	<0.01	<0.01	<0.02	<0.03	0.02
Benzo(b)fluoranthene	<0.02	<0.02	<0.04	<0.07	0.04
Benzo(k)fluoranthene	<0.01	<0.01	<0.02	<0.03	0.02
Benzo(a)pyrene	<0.01	<0.01	<0.02	<0.03	0.02
Dibenzo(a,h)anthracene	<0.01	<0.01	<0.02	<0.03	0.02
Benzo(g,h,i)perylene	<0.01	<0.01	<0.02	<0.03	0.02
Indeno(1,2,3,c,d)pyrene	<0.01	<0.01	<0.02	<0.03	0.02

Analytical Method (NIOSH): 5506

Table 6

Lab Number	Sample Description	Air Volume (Liters)	Particulate (mg)	Particulate (mg/m3)
789368	140101 AA-001, 140101 AA-002	448.5	0.1	0.2
789369	140101 AA-003, 140101 AA-004	414.8	0.1	0.2
789370	140101 AP-014, 140101 AP-015	283.9	0.3	1
789371	140101 AA-007, 140101 AA-009	641.9	0.2	0.3
789372	140101 AA-008, 140101 AA-010	589.3	0.1	0.2

Limit of Detection: 0.1 mg
Analytical Method (NIOSH): 0500 (modified)

Note

The particulate results have been blank corrected using a lab blank. Please note that a blank should be submitted with each sample set.

We appreciate the opportunity to be of assistance to you. Please call our Client Services Department at (313) 344-2650 or me if you have any questions.

Ellen Coffman for
Robert Lieckfield Jr., C.I.H.
Manager, Laboratory Services

CLAYTON ENVIRONMENTAL CONSULTANTS, INC.
22345 Roethel Drive Novi, Michigan 48050

Mr. Crowell Herrick
Engineer
ENVIROCON, INC.
P.O. Box 1154
Livingston, MT 59047

Date Reported: 24-JAN-90
Date Received: 2-JAN-90
Clayton Project No.: 62909-17

Dear Mr. Herrick:

The following is our report on the samples submitted for analysis.

Table 1

Lab Number	Sample Description	Air Volume (Liters)	Particulate	
			(mg)	(mg/m3)
794398	140101-AA-018	575	<0.1	<0.2
794399	140101-AA-019	633.2	<0.1	<0.2

Limit of Detection: 0.1 mg
Analytical Method (NIOSH): 0500

The results have been blank corrected using a lab blank. Please note that a blank should be submitted with each sample set.

Table 2

Lab Number: 794398
Sample Description: 140101-AA-018
Air Volume (Liters): 575

Compound	(ug)	(ug/m3)	Limit of Detection (ug)
Naphthalene	<0.1	<0.2	0.1
Acenaphthylene	<0.1	<0.2	0.1
Acenapthene	<0.3	<0.5	0.3
Fluorene	<0.01	<0.02	0.01
Phenanthrene	<0.01	<0.02	0.01
Anthracene	<0.01	<0.02	0.01
Fluoranthene	<0.01	<0.02	0.01
Pyrene	<0.01	<0.02	0.01
Benzo(a)anthracene	<0.01	<0.02	0.01
Chrysene	<0.01	<0.02	0.01
Benzo(b)fluoranthene	<0.02	<0.03	0.02
Benzo(k)fluoranthene	<0.01	<0.02	0.01
Benzo(a)pyrene	<0.01	<0.02	0.01
Dibenzo(a,h)anthracene	<0.01	<0.02	0.01
Benzo(g,h,i)perylene	<0.01	<0.02	0.01
Indeno(1,2,3,c,d)pyrene	<0.01	<0.02	0.01

Analytical Method (NIOSH): 5506

Table 3

Lab Number: 794399
Sample Description: 140101-AA-019
Air Volume (Liters): 633.2

Compound	(ug)	(ug/m3)	Limit of Detection (ug)
Naphthalene	<0.1	<0.2	0.1
Acenaphthylene	<0.1	<0.2	0.1
Acenapthene	<0.3	<0.5	0.3
Fluorene	<0.01	<0.02	0.01
Phenanthrene	<0.01	<0.02	0.01
Anthracene	<0.01	<0.02	0.01
Fluoranthene	<0.01	<0.02	0.01
Pyrene	<0.01	<0.02	0.01
Benzo(a)anthracene	<0.01	<0.02	0.01
Chrysene	<0.01	<0.02	0.01
Benzo(b)fluoranthene	<0.02	<0.03	0.02
Benzo(k)fluoranthene	<0.01	<0.02	0.01
Benzo(a)pyrene	<0.01	<0.02	0.01
Dibenzo(a,h)anthracene	<0.01	<0.02	0.01
Benzo(g,h,i)perylene	<0.01	<0.02	0.01
Indeno(1,2,3,c,d)pyrene	<0.01	<0.02	0.01

Analytical Method (NIOSH): 5506

Table 4

Lab Number: 794400
Sample Description: 140101-AA-020
Air Volume (Liters): 633.2

Compound	(ug)	(ug/m3)	Limit of Detection (ug)
Naphthalene	0.2	0.3	0.1
Acenaphthylene	<0.1	<0.2	0.1
Acenapthene	<0.3	<0.5	0.3
Fluorene	<0.01	<0.02	0.01
Phenanthrene	<0.01	<0.02	0.01
Anthracene	<0.01	<0.02	0.01
Fluoranthene	<0.01	<0.02	0.01
Pyrene	<0.01	<0.02	0.01
Benzo(a)anthracene	<0.01	<0.02	0.01
Chrysene	<0.01	<0.02	0.01
Benzo(b)fluoranthene	<0.02	<0.03	0.02
Benzo(k)fluoranthene	<0.01	<0.02	0.01
Benzo(a)pyrene	<0.01	<0.02	0.01
Dibenzo(a,h)anthracene	<0.01	<0.02	0.01
Benzo(g,h,i)perylene	<0.01	<0.02	0.01
Indeno(1,2,3,c,d)pyrene	<0.01	<0.02	0.01

Analytical Method (NIOSH): 5506

Table 5

Lab Number: 794401
Sample Description: 140101-AA-022
Air Volume (Liters): 575

Compound	(ug)	(ug/m3)	Limit of Detection (ug)
Naphthalene	0.2	0.3	0.1
Acenaphthylene	<0.1	<0.2	0.1
Acenapthene	<0.3	<0.5	0.3
Fluorene	<0.01	<0.02	0.01
Phenanthrene	<0.01	<0.02	0.01
Anthracene	<0.01	<0.02	0.01
Fluoranthene	<0.01	<0.02	0.01
Pyrene	<0.01	<0.02	0.01
Benzo(a)anthracene	<0.01	<0.02	0.01
Chrysene	<0.01	<0.02	0.01
Benzo(b)fluoranthene	<0.02	<0.03	0.02
Benzo(k)fluoranthene	<0.01	<0.02	0.01
Benzo(a)pyrene	<0.01	<0.02	0.01
Dibenzo(a,h)anthracene	<0.01	<0.02	0.01
Benzo(g,h,i)perylene	<0.01	<0.02	0.01
Indeno(1,2,3,c,d)pyrene	<0.01	<0.02	0.01

Analytical Method (NIOSH): 5506

Table 6

Lab Number: 794402
Sample Description: 140101-AA-024 BLANK

Compound	(ug)	Limit of Detection (ug)
Naphthalene	<0.1	0.1
Acenaphthylene	<0.1	0.1
Acenapthene	<0.3	0.3
Fluorene	<0.01	0.01
Phenanthrene	<0.01	0.01
Anthracene	<0.01	0.01
Fluoranthene	<0.01	0.01
Pyrene	<0.01	0.01
Benzo(a)anthracene	<0.01	0.01
Chrysene	<0.01	0.01
Benzo(b)fluoranthene	<0.02	0.02
Benzo(k)fluoranthene	<0.01	0.01
Benzo(a)pyrene	<0.01	0.01
Dibenzo(a,h)anthracene	<0.01	0.01
Benzo(g,h,i)perylene	<0.01	0.01
Indeno(1,2,3,c,d)pyrene	<0.01	0.01

Analytical Method (NIOSH): 5506

Table 7

Lab Number	Sample Description	Air Volume (Liters)	Tetrachloro-ethene		Trichloro-ethylene		1,1-Dichloro-ethylene	
			(mg)	(ppm)	(mg)	(ppm)	(mg)	(ppm)
794403	140101-AA-021	109	<0.004	<0.005	<0.004	<0.007	<0.001	<0.002
794404	140101-AA-023	93.4	<0.004	<0.006	<0.004	<0.008	<0.001	<0.003
794405	140101-AA-025	--	<0.004	--	<0.004	--	<0.001	--
	Limit of Detection:		0.004 mg		0.004 mg		0.001 mg	
	Analytical Method (NIOSH):		1003		1003		1003	

The results for 1,1-dichloroethylene have been corrected for a desorption efficiency of 94%.

Table 8

Lab Number	Sample Description	Air Volume (Liters)	Benzene		Chlorobenzene		Naphthalene	
			(mg)	(ppm)	(mg)	(ppm)	(mg)	(ppm)
794403	140101-AA-021	109	<0.002	<0.006	<0.003	<0.006	<0.01	<0.02
794404	140101-AA-023	93.4	<0.002	<0.007	<0.003	<0.007	<0.01	<0.02
794405	140101-AA-025	--	<0.002	--	<0.003	--	<0.01	--
	Limit of Detection:		0.002 mg		0.003 mg		0.01 mg	
	Analytical Method (NIOSH):		1501		1003		1501	

The results for naphthalene have been corrected for a desorption efficiency of 39%.

Table 9

Lab Number	Sample Description	Air Volume (Liters)	Chlorotoluene		1,2-Dichloro-ethylene	
			(mg)	(ppm)	(mg)	(ppm)
794403	140101-AA-021	109	<0.006	<0.01	<0.007	<0.02
794404	140101-AA-023	93.4	<0.006	<0.01	≤0.016	≤0.043
794405	140101-AA-025	--	<0.006	--	<0.007	--
Limit of Detection:			0.006 mg		0.007 mg	
Analytical Method (NIOSH):			1003		1003	

≤: The reported values reflect the upper limit of the actual sample concentration. The normal limit of detection could not be achieved due to interferences in the sample matrix.

Notes

Back sections were checked and showed no significant breakthrough.

Please note that other significant peaks were present in the chromatograms of the samples listed in tables 7, 8 and 9.

We appreciate the opportunity to be of assistance to you. Please call our Client Services Department at (313) 344-2650 or me if you have any questions.

Ellen Coffman for
Robert Lieckfield Jr., C.I.H.
Manager, Laboratory Services